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THE BOTANICAL GAZETTE

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CONTENTS:

On raised peat-bogs in New Brunswick.—*W. F. Ganong* 123
Notes on the flora of the St. Croix region (concluded).—*E. J. Hill* 126
A Visit to the West Indies.—*A. S. Hitchcock* 130
Notes on the apical growth of Liverworts. (With plate XIII.)—*David M. Mottier* . . 141
Some new Solanaceæ from Guatemala.—*John M. Coulter* 144
New Grasses.—*George Vasey* 145
BRIEFER ARTICLES 147
Simple mechanism to show geotropism: *Goodwin D. Swezey*.—Notes from Columbus, O.: *Aug. D. Selby*.—Continuity of the protoplasm in the chantransia-form of Batrachospermum: *Bradley M. Davis*.—A method of studying the growth of tubers: *Conway MacMillan*.—A monstrous form of the common field daisy: *B. W. Barton*.
EDITORIAL 151
A caution as to nomenclature.
CURRENT LITERATURE 152
Minor notices.
OPEN LETTERS 153
To phytographers.
NOTES AND NEWS 155
Personals.—Articles in journals.—Orchids of N. England.—Harvard Summer School.—Production of spines.—Desmids of Brazil.—Root tubercles.—The botanists at Washington.—Meehan's Monthly.—Fungi exsiccati.—Edible fungi.—Motion of sunflower heads.—New sorghum smut.—Nomenclature.—Michigan weeds.

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VOL. XVI. NO. 5.—BOTANICAL GAZETTE.—MAY, 1891.

On raised peat-bogs in New Brunswick.

W. F. GANONG.

In certain places near the sea-coast of Charlotte and St. John counties in the Province of New Brunswick there occur several large peat bogs, composed of the purest Sphagnum, which have their centers raised many feet above their margins. Such raised bogs must be exceedingly rare; indeed, Professor W. G. Farlow tells me that he has heard of but one other instance, which was in the case of a raised bog in Sweden described in a botanical journal some years ago. These in New Brunswick then must have a special botanical interest.

These bogs having come of late locally into notice for reasons to be referred to below, the present writer, who like many another botanist enjoys in his native place a reputation for omniscience in matters botanical, was called upon last summer to explain their origin. Not being able to do so, he found his natural and securest refuge in the usual resort in such cases, an habitual expression of scepticism (in this case nearly as much real as assumed) as to their very existence. All such refuge, however, was closed to him when, in August last, he, that is to say I, made a visit to one of them in company with a well-known enthusiast on peat bogs and skilful exponent of other local wonders, Mr. C. E. Boardman, of Milltown, New Brunswick.

The one we visited was near Seely's Cove, in Charlotte county, N. B., some twenty miles in an air line N. E. from Eastport, Maine. This bog lies on the right of the highway as one approaches the coast, and is over a quarter, perhaps half a mile in length. It is relatively narrow, being not more than one-sixth of that distance in breadth, perhaps less. It lies in a general N. and S. direction, nearly parallel, at its upper part at least, with the highway road, and therefore with the high land. It rises gently from the margin all around until it attains a height of about ten feet, when it slopes still more gently, probably four or five feet higher, and then becomes flat topped, and so runs for the above mentioned length. Its section would present about the curve of a loosely strung

bow which bends rather abruptly toward the ends. Its surface is entirely naked and clear of trees and shrubs of any kind with the sole exception of an occasional very much dwarfed blueberry bush; and according to local tradition it has always been so. The same authority, it may be added in passing, says that it is growing in height; basing the statement upon the observation that teams and people at the lower end, which could formerly be seen from the upper, cannot now be so seen, a point not likely to escape notice in a sparsely-settled district where the doings of one's neighbors are of so much moment.

The bog is composed of nearly pure Sphagnum of the finest kind, free from all roots and similar impurities and showing not a trace of decay or anything resembling muck. Some few other mosses and lichens occur on the surface, but appear to form no part of the material below. The living material above merges gradually downwards into a clear, odorless, carbonaceous, semi-peat like material, which has been found to have important economic properties dependent upon those qualities. It is soaked with an abundance of water, clear and cold, and hence totally unlike ordinary bog-water. Its clearness was plain to the eye as it flowed from a squeezed handful of the moss, its coldness to the senses, both by its feeling when a hand was thrust into it, and also by the satisfactorily refrigerated condition of the liquid portion of our luncheon which was buried in it for a time to await our return. The bog does not tremble under foot. It is bounded on one side only by high land, and on the other it slopes down and merges into a flat bog of the ordinary kind which is of great extent. The latter presents all the ordinary bog characters, dirty water, muck, trembling places, and a growth of clumps of small spruces and the ordinary ericaceous shrubs; in fact it is the common every-day bog we all know. It is a novel and pleasing experience to walk from the dirty quaking affair up a slope to one so clean and compact.

My guide, with his veracity fully vindicated, was of course triumphant, and he gave me many details as to others, the principal of which he has had the kindness to repeat in a letter. His business during the past two years has taken him over every part of this section of the country; and as he has been specially on the look-out for the bogs, his observations are valuable. In all he knows of sixteen bogs of considerable

size, of this raised character, the areas of which vary from a few up to three hundred acres, the total acreage of all sixteen being estimated at about eleven hundred acres. They vary in height from a few feet up to as much as forty or fifty. They are all comprised within a limit of about thirty miles, between L'Etang Harbor and Musquash; and although a careful search has been made for others in other parts of New Brunswick and in Maine, none has been discovered. They are all near the coast, with only two or three exceptions being within two or three miles of the salt water, only one of them being as far as four miles away. Very few of them have any level bog portion. They are all entirely clear of trees or bushes, and composed of clear, clean Sphagnum. In one or two cases Mr. Boardman has bored to the bottom of the smaller ones and found them underlaid by clean gravel; in other cases the boring apparatus, adapted to go down twelve feet, did not reach bottom, and it brought up in all cases only close clean carbonized peat-moss, with no trace of muck. At Musquash one of the largest, though not a very high bog, is being extensively worked for the moss, which has been found exceedingly valuable as a bedding for horses and cattle. The workings have there gone to a depth of forty-four feet without finding bottom or muck impurities. The great purity, freedom from decay, antiseptic and absorbent powers of the carbonized moss promise to create a local industry of much importance; and practical men are there putting energy and capital into mining and experimenting with it.

Lest my readers, habituated to the appendage of a theory to all statements of facts, should experience a shock by its absence, I hasten to be in the fashion and offer my "theory" of their origin. I can speak personally only of the Seely's Cove bog, but possibly what is true of it may apply to others also. I think its origin and growth are connected with the great prevalence in this region of large, clear, cold springs. In fact there occur a few miles away single springs which are large enough to give origin to large brooks, and the water is invariably very cold and clear. A most famous spring of this character occurs on the line of railway a few miles from St. George and smaller ones are abundant everywhere. The purest water I ever saw, even in New Brunswick, where so many streams are crystal-clear, was in a spring brook within a mile or two of this bog. Now it is noticeable that the upper

end of the bog comes in contact with the high land, and that it is for some distance parallel with it, that it is long and relatively narrow, and that on the side away from the higher land it sinks down to a large bog of the flat kind. I think it extremely probable that a huge cold spring (or a line of them) comes out from the high land at the upper end of the bog, and the water then flows along toward its lower end on the bottom, being soaked up as it goes. The bog then grows and carries up the water sponge-like with it, and when off to one side the influence of the spring diminishes and is finally lost, the ordinary bog conditions begin to prevail. All this is confirmed by the fact of which Mr. Boardman assures me, that there flows out from its lower end a brook of clear, cool water, large enough so that in times past it has turned the wheel of a mill. Water of this character does not flow from common bogs and a spring origin seems necessary to account for it.

One other point remains to be explained. Why are they treeless and shrubless? This I believe to be due to the coldness of the water supplied by the springs. The temperature is too low for the growth of the roots of shrubs or trees. Its coldness has been already referred to; even at a depth of but a few inches this was very marked. It is perhaps, too, a point of importance that the bog bears in greatest profusion the cloud-berry, *Rubus Chamæmorus;* so abundant is it that the inhabitants resort to the bog with pails and gather it in great quantities. This northern plant finds so congenial a home but rarely in these latitudes, and seems to point to the cold conditions prevailing in the bog. I advance this explanation but tentatively. Perhaps some of our botanists who take their outing in that favored region will give it their attention.

Harvard University, Cambridge, Mass.

Notes on the flora of the St. Croix region.

E. J. HILL.

(Concluded from p. 113.)

The rest of the time in the St. Croix region was given to the Chesago Lakes, situated a few miles west of Taylor's Falls. Three days of the early part of September were mainly devoted to an examination of the water-plants, or to those of

the immediate shore. The body of water designated as above, or more often in the singular number, is made up of three principal sheets of water joined by narrow straits, and with numerous small bays indenting from its shores. On a tongue of land projecting from its eastern side is the village of Center City, the county seat of Chesago county, ambitious in name but diminutive. This was my stopping place, in the midst of a population almost wholly Swedish. There were fine farms around, and the many goodly farm buildings showed thrift and comfort. When one strolled into the fields and woods, there was a strong reminder of Ohio and New York in its better cultivated parts, though the hills were lower, and the beech, the chestnut and the tulip-tree were noticeably absent from the woodlands. But most of the other trees were there, the maple in abundance; and all the humbler plants, the asters, and goldenrods in the corners of the crooked fences, and those spared by the sheep and cattle feeding in the woods, had a familiar look.

The lakes and ponds abounded in species of *Potamogeton*. The shallower and more sheltered parts were covered with pond-lily plants, Nymphaea reniformis and Nuphar advena. Allusion has been made in a former article to the quantities of *P. Robbinsii* here. It almost filled the water in some places to the exclusion of other plants. The season was late for good specimens in fruit, as most of it had fallen off, but some was obtained in good condition. *P. prælongus* was also very abundant in deeper water, taking other areas quite to itself. So it may be said of *P. perfoliatus*, var. *lanceolatus*, and *P. pectinatus*, in places most suitable to their growth. Along the west side of a long point of land extending south from the railway station, *P. Spirillus* was sparingly found. I had not before seen it at the West, where it seems rare and local. One more station has been given for it in Minnesota, Prof. L. H. Bailey having found it in Long Lake, in the extreme northeastern part of the state, in 1886. I have not met with it in Michigan. Wheeler and Smith in their Catalogue of Michigan Plants credit it to the Upper Peninsula on the authority of Gray's Manual, the entry being "Lake Superior." But this is very general, and may be outside of Michigan, though there is no reason to question its presence in that state, except its rarity and the indefiniteness of the locality. Dr. Vasey has found it in northern Illinois, in McHenry coun-

ty. This and the two stations for Minnesota are the only ones concerning which I have definite information for the Upper Mississippi and the Upper Lakes within the bounds of the United States. P. Spirillus is a common plant in some of the small lakes of western New York. Those I have seen there were generally furnished with well developed floating leaves. In the few specimens seen in Chesago Lake, the floating leaves were rare, the plants being almost always entirely submersed. It probably occurs in other parts of the lake, but time was lacking for a thorough search. My experience shows that the habitat assigned to this plant in Gray's Manual is too exclusive in character. I have heretofore found it in small lakes, not in streams. It grows along the shallow margins of these lakes, taking the shelving beach from where the water is about a foot and a half in depth to where it shallows to three or four inches. In the latter situations it may be left bare of water for a time when the winds blow off shore. Under such conditions it grows in tuft-like masses, with short and very leafy stems, being little more than a bunch of leaves.

Some of the plants of the shore were of considerable interest. *Sagittaria heterophylla* Pursh bore stamens the length of whose filaments allied it to the section containing S. variabilis more than to that containing S. heterophylla. They were two or three times as long as the anthers, but had a lance-ovate, very glandular base. Some of the leaves were sagittate with narrow appendages. The beaks of the fruit were turned to one side, and could hardly be called erect. *Juncus pelocarpus* E. Meyer grew in the wet sands of the shore. *Cyperus Engelmanni* Steud. had spikelets considerably flattened, or quite far from terete. *Hemicarpha subsquarrosa* Nees, generally but an inch or two high, was abundant in some places. Its scales were barely recurved at the point. Nearly all of the culms bore one or two small additional involucral leaves.

The most interesting plant of the wet shores was *Scirpus debilis* Pursh. Its flowers were uniformly characterized by two stamens, no exceptions being found as far as they were examined, and this extended far enough to establish the fact as a rule. The style was two-cleft, and all the bristles usually longer than the achenium. This was somewhat plano-convex, broadly obovate, thick, rugulose, shining, from dark brown to black in color. The stems were convex on one side

and grooved on the other, a cross section being meniscoidal rather than grooved-triangular when the stems are fresh. It was exceptional to find the involucral leaf horizontal at maturity. The stems grew in quite large tufts, much like Eleocharis obtusa in habit. They were from six to fifteen inches long, frequently recurved or prostrate. Though variant from the species as described, it hardly seems separable from the type, as the number of stamens either in Scirpus or Eleocharis is not constant. The present season (1890) I have found essentially the same form in two places near Chicago, at Millers and Dune Park, Ind., in the Pine Barren region. These are stations on the Michigan Southern R.R., about five miles apart, and the plants were obtained from the wet sands of the ditches skirting the railway. Considerable pains were taken to see if the flowers had more than two stamens. A dozen clusters of spikelets were selected, generally from stems borne on different roots, and three or four flowers from each cluster were examined. The style proved uniformly two-cleft, and the stamens two in number. I looked in vain for an exception, but would not affirm that it may not be found. This seemed the more curious, because in 1877 I collected S. debilis of the typical form only a few rods from where it was found this year at Miller's. It was along a roadway in a field beside the railroad. It was sought again in the same locality, but in vain, the grass having supplanted it, or the grazing cattle having destroyed it. An examination of the dried specimens shows that they have flowers with three stamens. It is doubtful whether the two sets of gatherings from these contiguous spots on different years are of the same group, for this constancy of difference would hardly be expected. But those of 1890, though much farther apart, are referable to the same group, since they are from the ditch along the same side of the track, though this is not continuous, being crossed or interrupted by some low ridges. But plants readily spread under such conditions. In other respects the plants were quite like those from Chesago Lake.

In the wet sands near the station at Center City *Ranunculus Flammula* L. was frequent. The stems are ascending or erect, from three to five inches high. The lower leaves are linear to oblong-linear, and from one to two inches long. The flowers are from one-fourth to one-third of an inch in diameter, with five to seven petals. This is the second time

I have come across this form of the plant, having previously seen it under similar conditions of growth at Escanaba, Mich. Upham gives Minneapolis as another station for it in the state. Its range in Gray's Manual is given as "shore of Lake Ontario, and northward." As the Manual is for the United States I suppose this means the southern shore. Macoun gives it for the Canadian shore, and "the gravelly banks of rivers to lat. 69° (*Richardson.*)" The Michigan and Minnesota plants are interesting as extending the geographical range farther up the Great Lakes and into the region of the Upper Mississippi. The plant evidently conforms to the var. *intermedius* in the Manual. The conditions of growth may have something to do with the erect or semi-erect habit of the stems. In both cases where found these were carefully noted and compared with those of var. *reptans*, the common form. I have always found the latter in open places, in sand or gravel quite bare of other vegetation, or with plants low or creeping like itself, and not shading it. In the var. *intermedius* the plants grew among scattered spears of grass and rushes, considerably overtopping and shading them. It could not easily lie on the ground and root at the joints, though there is sometimes a tendency to this in the lowest joint or two. The erect or ascending stems—the latter the more common position—are so slender that they could hardly support themselves if deprived of the shelter and protection of the surrounding plants, and forced into the conditions of the creeping stemmed variety. They often lean against these plants as if too weak to stand alone, and are apparently struggling upward toward the light.

Englewood, Chicago.

A visit to the West Indies.

A. S. HITCHCOCK.

The readers of the GAZETTE may be interested in a few of the observations made during a recent trip to the West Indies.

The expedition was organized and conducted by Dr. J. T. Rothrock, of the University of Pennsylvania, in whose yacht, the White Cap, we lived during our absence from the United States. We started from Fernandina, Florida, Nov. 4th,

1890, and returned to the same port Jan. 29th, 1891. Our vessel, a yawl-rigged schooner of fifty-one tons, was commanded by Capt. Freeman Boynton, an experienced navigator in the West Indian region. The party consisted of Dr. Rothrock, D. J. Bullock and J. P. Moore, of Philadelphia, and the writer.

The month of November was spent cruising through the Bahamas of which group we visited New Providence, Eleuthera, Cat Island, Watlings, Crooked Island, Fortune Island and Great Inagua.

Excepting Inagua the islands are quite similar in geological and floral characters. Over the coral limestone are scattered thin patches of soil which have collected in the depressions, the larger and deeper of which are termed banana holes. It was surprising to see so much vegetation growing from so little soil. But the ligneous flora consists mostly of shrubs, eight or ten feet high, while trees of even moderate height are uncommon, although Andros is said to be thickly wooded.

The land owners are at present greatly interested in the cultivation of Sisal hemp,[1] the fiber of which promises to become an important production of the islands. The plant is admirably adapted to thrive on the almost soilless rock, where few other economic plants would grow. When a plantation is once established successive crops are taken from the same plants.

The pine apple[2] is cultivated more or less throughout the islands but chiefly on Eleuthera, where the peculiar red soil, which is best fitted to produce the finest fruit, is found in greater abundance. No fertilizer had been used, and the growers found that the soil, strangely enough, was wearing out, with no virgin soil to draw upon. This result will come about in time, even in a tropical country, especially where the soil is thin. But now a chemical fertilizer is imported from the United States and the land is yielding large returns.

The cocoa-nut[3] is cultivated everywhere especially near the sea-shore, where it finds the best conditions for its growth. The milk of the nut is very refreshing to a thirsty traveler. Many a time, on a hot day, when oppressed by the heat, I

[1] Agave rigida Mill. var. Sisalana Engelm. Acad. St. Louis, iii. p. 316. (For article on the industry, see Northrop, Pop. Sci. Mo. Mar. 1891.) The names following are those used in Grisebach's Flora of the British West Indies.

[2] Ananassa sativa. (Bromel.)

[3] Cocos nucifera. (Palm.)

have made my way into a plantation, found a tree where the nuts were within reach, cut one off and with my machete, slashed away a portion of the thick husk surrounding the nut, made an opening through the shell, and quaffed the cool and pleasant flavored liquid within. The green cocoa-nut contains only milk, but as it ripens the "meat" deposits around the interior, at first soft and nearly tasteless, but finally hard and sweet as in the nut of our markets. While the meat is yet soft it is much relished by some, but to me it was insipid.

At Crooked Island we saw the French wells, which are cut in the solid rock scarcely above the sea level, and some half buried cannon both of which are supposed to date back to the time of the buccaneers. Along the shores we saw innumerable piles of conch shells, each with a small hole broken in the end, where the conch had been pushed from its fastening by the fishermen. The flesh, which to me tasted like boiled leather, is much esteemed by the natives.

The southern islands of the group yield large quantities of salt. Sea-water is run into shallow ponds, each owner having his portion partitioned off by a stone wall, where it is evaporated by the sun. The residue is scraped into large heaps near by, where it is allowed to remain exposed to the sun and rain, apparently without serious loss.

Inagua differs somewhat from the other islands of the group. It is larger, more nearly circular in outline, and has a deeper covering of soil. There is a more decided change in the flora, Florida types being replaced by those of Cuba and Hayti. Grass land is comparatively abundant, affording pasturage for stock. In the interior of the island are savannas which appear to be dried up salt marshes. The experience acquired during a trip to this region will furnish our party with ample material for mosquito stories during the rest of their lives. The little pests were simply intolerable. As we walked along they flew up in clouds from the grass, biting through our clothes and even crawling up our sleeves for a good drink of our rich northern blood. No doubt the recording angel, that day, was obliged to devote considerable attention to Inagua. I tried smearing the exposed parts with oil of pennyroyal and vaseline, as has been recommended, but it was of little avail against Inagua mosquitoes. On the other hand, while in Jamaica we were not troubled by insect pests of any kind, except, in certain localities, by the ticks.

Nor were we nearly so uncomfortable from the heat, as in the Bahamas.

The trees in common cultivation through the Bahamas are poinciana,[4] with its long pendent pods and feathery foliage, which is deciduous in January; the almond,[5] easily distinguished at long distances by its flat-topped, imbricated foliage; "cedar",[6] sand-box,[7] and, of course, the cocoa-nut and banana.[8] The silk-cotton tree,[9] or "big tree" as the inhabitants have christened it, near the post office at Nassau, figured in Garden and Forest (vol. iii. p. 347), is a magnificent specimen, but is peculiar in being low and wide-spreading instead of tall and proportionately more slender as is usually the case. In Jamaica it is one of the tallest trees of the forest, sometimes rising a hundred feet to the first branch. It is used extensively for making canoes, which are hollowed out from a single log, but is of little value otherwise.

The silver-top palmetto[10] occurs abundantly throughout the Bahamas. It is used by the natives for thatching their huts; and also for making hats, mats, baskets, ropes, etc., for which purpose the central unexpanded bunch of leaves is employed.

After leaving Inagua, we sailed for Kingston, Jamaica. During our six weeks stay on this beautiful island we visited, after leaving the capital, Port Morant, Port Antonio and Lucca. The party made a most delightful trip to the summit of Blue Mountain Peak, distant from Kingston twenty-one miles. The journey to Gordantown, about half way, was made in carriages, the remainder on horseback, our provisions and apparatus being carried on pack mules. Although midwinter, flowers were abundant, as were ripe strawberries, which we picked and ate with relish. Above 5,000 feet, approximately, tree-ferns[11] appeared and gave a decided tropical look to the forest. Blue Mountain Peak reaches an altitude of about 7,300 feet, the highest point on the island. The temperature at noon was 55° F., but it is said that ice occasionally forms. From 2,000 to 4,000 feet elevation coffee and

[4] Poinciana regia. (Legum.)
[5] Terminalia Catappa. (Combret.)
[6] Casuarina equisetifolia. (Ament.)
[7] Hura crepitans. (Euphorb.)
[8] Musa sapientum. (Musac.)
[9] Eriodendron anfractuosum. (Bombac.)
[10] Thrinax argentea. (Palm.)
[11] Cyathea arborea. (Filic.)

cinchona plantations are frequently seen. We saw several more or less ruined drying-floors which were formerly used for drying the coffee. These were made by paving or cementing a square of level ground in a sunny situation.

As has been noted by most travelers in tropical regions the most striking feature of the vegetation to a person coming from the north, is the varied character of the flora. One rarely sees areas in which one species is conspicuously predominant. No one type is able to exclude others by force of numbers as in temperate climates. Another effect is the extension of the flowering season of a given species. There is to be sure, a season during which most of the flowers are produced, but one is almost sure to find stragglers in bloom at all times of the year.

Compared with the central United States, we find in Jamaica several exotic orders largely represented, as Malpighiaceae, Melastomaceae, Myrtaceae, and Piperaceae. Others of which we have but a few outlying members are there in abundance; as, Apocynaceae, Acanthaceae, Rubiaceae, Laurineae, Aroideae and the genera Solanum, Ipomoea and Croton. One cannot fail to observe also the more familiar orders Malvaceae, Leguminosae, especially Cassia and Mimosa, and a great variety of ferns. Ferns in the swamps; ferns on the arid rocks; ferns that are epiphytes; ferns that are climbing, either on trees by rootlets, or over bushes on by recurved spines; ferns of all sizes and shapes from the great tree ferns with fronds ten feet in length down to the wee species, an inch long, growing in the moss on its trunk. Aroideae will also attract attention, especially large leaved Philodendrons, climbing the tallest trees, and sending down long air-roots, which hang suspended like ropes, in fact they are used by the natives instead of ropes. The innocent looking Canna-like, but much dreaded, dumb cane[12] is another interesting member of the order.

Orchids are abundant, especially the epiphytic species. To see great bunches of these, many kinds in full flower, and the assortment of Tillandsias, or wild pines perched all along the branches of a half dead mango or silk-cotton tree, is a beautiful and, to the collector, usually a tantalizing sight.

On the other hand many orders, large at home, are scarcely represented in Jamaica; as, Ranunculaceae, Cruciferae, Caryophylleae, Rosaceae, Umbelliferae and the genus Carex.

[12] Dieffenbachia Seguine. (Aroid.)

Even composites are scarce. Of Cacteae I observed *Opuntia Tuna* common along the coast; *O. coccinellifera* and *O. Ficus-indica*, introduced around dwellings, *Melocactus communis*, in arid places; *Cereus grandiflorus* and one or two other trailing or climbing *Cerei; C. Swartzii* and *Opuntia spinosissima*. The last two species were particularly abundant on the palisades, an extremely sandy tongue of land, at the end of which is Port Royal. *O. spinosissima* sometimes grows to the height of 25 feet and is truly a tree cactus, the straight and frightfully spiny trunk being crowned by a spreading or pendent series of oblong joints. C. Swartzii (botanically so called in Jamaica) also grows to the height of 25 or 30 feet and has the habit of C. gigantea. It is used extensively for hedges, being planted very close and kept trimmed to a given height. Another hedge plant much used is the Pinguin.[13]

Euphorbia antiquorum is introduced in many places, especially in the Bahamas, and where established, often occupies considerable area to the exclusion of everything else, forming a prickly and impenetrable thicket ten or fifteen feet in height.

On Eleuthera and some of the neighboring islands grows a species of *Agave*, with the flower stalk 25 or 30 feet high. This is, curiously enough, called "bamboo" by the natives.

The real bamboo is extensively naturalized in Jamaica, and is used for a variety of purposes. Many of the huts are made by weaving the split bamboos into upright posts and thatched with "cane" (sugar cane) or wild cane.[14] Baskets and other small articles are made from the finely split culms; drinking cups and other vessels from the closed joints; fences, including the posts, are largely made from this grass.

To me one of the greatest curiosities of the flora was the mangrove[15] swamps. These have been frequently described but must be seen to be appreciated. We saw a very fine grove at Port Morant, at the head of the bay and lining each side of a small river which enters it at that point. From the outside it presented a most beautiful bank of glossy, dark-green leaves, reaching to the water's edge. Inside, however, one sees about as dismal a view as can be imagined. The trees all perched on spider legs, through whose intricacies a

[13] Bromelia Pinguin. (Bromel.)
[14] Arundo sp. (Gram.)
[15] Rhizophora Mangle. (Rhizoph.)

man could scarcely make his way ten feet, the absence of life, except the devilish looking crabs, crawling around on the roots, the stillness, and often the vile odor of rotten oysters, all combine to make a mangrove swamp, though fascinating, a place to be left as soon as possible, and I always felt, on leaving as if I were being chased by all sorts of bacterial germs. In some places land is being reclaimed from the sea quite rapidly by these swamps. The trees live only in salt water and die off as soon as the land is dry. Thus the inner edge of a swamp is composed of dead or dying trunks or loop like roots, while the outer edge is constantly pushing out into the water as soil is gradually accumulated by the roots. This extension seaward is carried on first by means of the aerial roots which either spring from the arched roots, in which case they curve outward and downward, or from the branches, when they drop nearly vertically. These frequently branch and re-branch before reaching the mud in which they become fastened.

The second method is by means of the young plantlet, whose radicle elongates considerably before dropping from the tree, so that it is all ready to start out in life as soon as released. It is 8 or 10 inches long and cigar-shaped, thus placing the center of gravity near the lower end. In this condition it is carried in the water till the lower end strikes the mud, when roots are sent down, the leaves are developed and a young mangrove is started.

Along the seashore one sees an abundance of the seaside grape,[16] named from the likeness of the clusters of fruit to our cultivated Vitis and not from habit, for it is a straggling shrub or tree with large, round, smooth and unusually red-veined leaves.

Another common plant of the lowlands and one which the collector is likely to remember with regret is the necker-bean.[17] This is a more or less climbing shrub, having the stem, petioles and even the under side of the midribs armed with recurved prickles and bearing clusters of spiny pods which contain about two drab seeds of the size of marbles. The hand is easily introduced to gather the flowers, but the withdrawal is resisted by dozens of prickles — like a patent rat-trap.

In swampy places one usually finds the familiar Job's tears[18]

[16] Cocoloba uvifera. (Polygon.)
[17] Guilandina Bonducella. (Legum.)
[18] Coix lachryma. (Gram.)

with which baskets and other ornamental articles are made. At first sight one would hardly think that the hard bean-like seeds belonged to a grass.

In the forest we saw many trees whose names were familiar. Among them was the mahogany,[19] a majestic tree with globular woody fruit and abruptly pinnate leaves; and the logwood,[20] a small, leguminous tree, bearing at that season an abundance of flowers and fruit, and extensively naturalized in Jamaica. Large quantities of its wood and also of fustic[21] are exported for extracting the dye. As it is very bulky it would seem more economical to extract the dye on the island.

The trumpet tree,[22] rather common and quite conspicuous from its large leaves whitened beneath and clustered at the ends of the long branches, is quite useful on account of the fiber obtained from the inner bark. Out of this is made a very durable cordage; also whips by peeling back the bark, cutting off the inner wood except enough for a handle, and plaiting the fiber into a lash.

In the dense woods grows the cacoon,[23] a high-climbing leguminous vine bearing an immense pod as much as three or four feet long which contains the large sea-beans often washed up by the sea on sandy beaches.

Many woody climbers in their youth entwine various trees, but these in time are strangled to death and rot away leaving the ungrateful vines as huge spirals, capable of bearing their own weight, having destroyed the ladders by which they mounted to their success.

I now mention a few of the more important fruits. Of the Anonaceæ there are the sugar apple,[24] about the size of an orange and green, the one-seeded carpids composing it being easily separated from each other; the custard apple[25] of about the same size but with the surface smooth and light brown; the sour sap,[26] larger, ovoid with the green surface weak-prickly; and the cherimoya[27] (Jeremiah, as the natives pronounce it), about the size of the foregoing, but with the

[19] Swietenia Mahogoni. (Meliac.)
[20] Haematoxylon Campechianum. (Legum.)
[21] Maclura tinctoria. (Urtic.)
[22] Cecropia peltata. (Urtic.)
[23] Entada scandens. (Legum.)
[24] Rollinia Sieberi.
[25] Anona reticulata.
[26] Anona squamosa.
[27] Anona Cherimolia.

surface smooth and faceted. This last is certainly the most delicious fruit I ever tasted. We saw it only on Blue Mountain. The sour sap is acid and at first seemed to have the flavor of kerosene, but we soon became accustomed to it and when beaten up with sugar it was quite a delicacy.

The papaw,[28] a smooth yellow fruit, of one to three or even ten pounds weight, containing the numerous shot-like seeds in the center, tastes not unlike muskmelon. The guava,[29] from which the delicious guava jelly is made, is about the size of a lime, and like the pomegranate, contains so many seeds that it is not desirable eating though pleasant flavored.

The naseberry,[30] or sapodilla as it is called in the Bahamas and to some extent in Kingston, is also about the size of a lime, but has a rough brown skin and one or two large black seeds.

The alligator pear[31] was a grievous disappointment. It is about the size of a goose egg and contains one large seed surrounded by yellow, and to us very insipid, flesh. It was learned that it should be flavored with salt, pepper, vinegar, savory, etc., when its insipidity would be overcome.

The mango,[32] in spite of its slight turpentine flavor, was very good eating, but it requires considerable experience to eat it without daubing the juice all over the face. The fruit is somewhat larger than the alligator pear and flattened. It contains a large seed, whose surface is covered with long fiber, out of which the pulp must be sucked.

Oranges, and sweet ones, too, are plenty. We bought them at fifty cents per hundred. Bananas are also abundant, but strange to say, we found great difficulty in getting ripe ones, as they are picked for shipment when green. They sell for twenty-five cents a bunch. Plantains[33] resemble bananas but can be distinguished by the longer neck to the fruit. They are eaten fried in cocoanut oil or butter, being while raw very inferior to bananas.

The akee[34] is a red, pear-shaped or slightly three-sided fruit, which contains a pulp (arillus) of the color and consist-

[28] Carica Papaya. (Papayac.)
[29] Psidium Guava. (Myrtac.)
[30] Sapota achras. (Sapotac.)
[31] Persea gratissima. (Laurin.)
[32] Mangifera Indica. (Terebinth.)
[33] Musa paradisiaca. (Musac.)
[34] Blighia sapida. (Sapind.)

ency of beef-fat. At maturity it bursts open, exposing the large, glossy black seeds. It is used to flavor fish.

There are several starch-containing food plants which are little seen in the north. The yam[35] probably furnishes more food in Jamaica than any other plants grown. It seemed inferior to either the sweet potato or the Irish potato, being coarser and rather tasteless. The tuberous roots are large, irregular, and frequently weigh several pounds.

The cassava[36] (tapioca, mandioca) also furnishes a large amount of food to the poorer classes. The rhizomes are six or eight inches long and rather slender. The skin is peeled off, the flesh grated and mashed thoroughly with water. The residue is used to make cassava bread or cakes. The wash water is allowed to stand, when the suspended matter settles. This is used for starching clothes.

A third starch producing plant, quite common along the northern coast of Jamaica, is the coco.[37] This somewhat resembles a giant calla-lily. The rhizomes, or "coco-feet" are roasted and eaten quite commonly by the natives. The arrow-root[38] belonging to the canna family is also grown.

The bread-fruit[39] tree is cultivated, and has become naturalized in many places. The fruit, which looks like a big osage orange, is much relished by Jamaicans, but as was the case with many tropical fruits and vegetables, it seemed to us to lack flavor. Its near relative, the jack-tree[40] with much larger oblong fruit is less common.

The chocho[41] a prickly oblong vegetable resembling a cucumber, is prepared for eating in the same way as squash and tastes like it.

The ocara,[42] not uncommon in northern gardens; bay-berry[43] whose leaves are often used for flavoring; allspice,[44] rose-apple,[45] a tree with leaves like the mango, but with large white flowers having numerous long stamens; tama-

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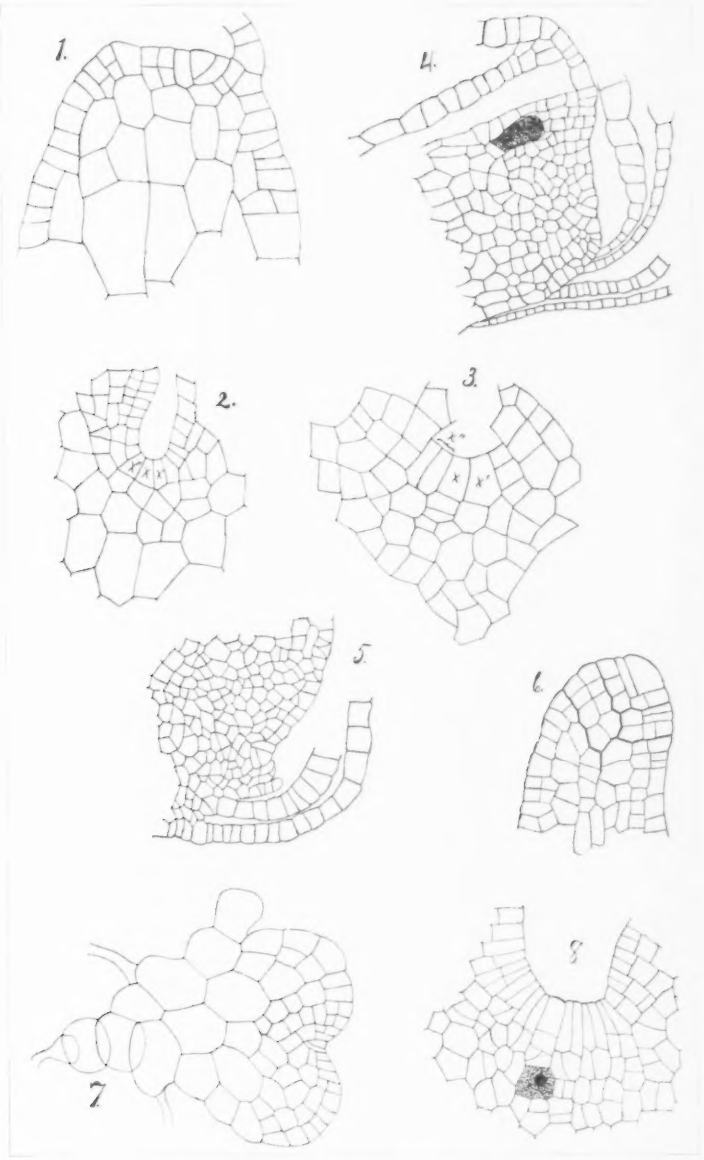
[35] Dioscorea, alata, etc. (Diosc.)
[36] Janipha Manihot. (Euphorb.)
[37] Colocasia esculenta. (Aroid.)
[38] Maranta sp. (Scitam.)
[39] Artocarpus incisa. (Urticac.)
[40] A. integrifolia.
[41] Lechium edule. (Cucurb.)
[42] Abelmoschus moschatus. (Malvac.)
[43] Pimenta acris. (Myrtac.)
[44] Pimenta vulgaris.
[45] Jambosa vulgaris. (Myrtac.)

rind,[46] whose pods contain sweet but slightly acid pulp frequently put up as preserves; pigeon-pie;[47] calabash,[48] a tree with few wide-spreading, horizontal branches and fascicled, oblanceolate leaves, the fruit of which is made into drinking vessels, etc.; the cashew,[49] whose roots taste something like peanuts; the star-apple,[50] a beautiful tree with leaves glossy, dark-green above and ferruginous silky-pubescent beneath; the bimbling[51] bearing its exceedingly sour fruit directly from the trunk; the annatto[52] (spelled also annotto, arnotto, etc.,) with prickly pods, the contents of which yields to water the red coloring matter of commerce; all these are frequent in cultivation, and were to us among the most interesting features of the island

Two other plants deserve mention. One is the sorrel[53] which we observed only in the Lucca district, where it is common. It grows to the height of three or four feet, losing its leaves in the fall. The calyx continues to grow and becomes ripe about Christmas. It is then a brilliant scarlet and quite juicy, tasting like Oxalis. The juice is extracted with hot water, flavored with spices and sweetened, thus making a very refreshing drink.

The second plant is the coco or cacao,[54] from which chocolate is made. The peculiarity of this tree is that the small flowers grow in fascicles right out of the trunk. One sees flowers and all stages of fruit on the same tree. The latter when ripe is a dark red in color, ovoid, six or eight inches long, with ten longitudinal furrows. The seeds are washed free from pulp, carefully dried, and (when made by the natives on a small scale) pounded into coarse powder between stones. To this is added cocoanut oil and enough annatto to color it, when it is formed into cylinders about the size of a candle and six or eight inches long. The cocoanut oil is prepared by grating up the ripe nut, usually very laboriously by the use of an ordinary tin grater, boiling the meal with water and skimming the oil off. A little annatto is usually added to give it a yellow color.

[46] Tamarindus Indica. (Legum.)
[47] Cajanus Indicus. (Legum.)
[48] Crescentia Cujete. Bignon.)
[49] Anacardium occidentale. (Terebinth.)
[50] Chrysophyllum Cainito. (Sapot.)
[51] Averrhoa Bilimbi. (Oxalid.)
[52] Bixa orellana. (Bixin.)
[53] Hibiscus Sabdarifa. (Malvac.)
[54] Theobroma cacao. (Buettner.)



MOTTIER on APICAL GROWTH OF LIVERWORTS.

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On our way home from Jamaica we stopped for three days at Grand Cayman. This is a small coral island midway between Jamaica and the west end of Cuba, and a dependency of the former. The inhabitants are mostly white, very hospitable, and differ from those of the other islands visited in being active, thrifty and enterprising. Here we saw the walnut,[55] whose fruit resembles our black walnut in taste, shape and in being enclosed in a rather woody shuck.

Another interesting tree which we did not see in Jamaica, was the manchioneal.[56] The inhabitants told great stories about its deadly effects and warned me against it. To test the matter I rubbed some of the fresh juice on the back of my hand, allowing it to remain three hours, without result. This only proves that the plant does not always have the effect ascribed to it. But it seems to be a fact, from the common report, that the juice will frequently form bad sores where it touches the skin. As is the case with our poison ivy, it probably depends upon circumstances and the individual.

During the trip I made collections of seeds, living plants and herbarium specimens which are being studied at the Garden. There are many difficulties in the way of collecting dried plants in the tropics. One of the worst is the humidity of the atmosphere. I succeeded in avoiding all trouble from mould by using drying paper (best quality carpet paper) which had been previously impregnated with corrosive sublimate. I used wire presses, with straps, changed the papers at least twice a day, and frequently exposed the already dried bundles to the sun.

Missouri Botanical Garden, St. Louis.

Notes on the apical growth of Liverworts.

DAVID M. MOTTIER.

(WITH PLATE XIII.)

The striking similarity between the very young thallus of certain liverworts and fern prothallia is a familiar fact to botanists and has led me to suspect that a careful study of the apical growth of several available forms, by more accurate

[55] Aleurites triloba. (Euphorb.)
[56] Hippomane mancinella (Euphorb.)

methods than have been heretofore used, might perhaps throw more light upon the affinities of these groups of plants, or add something toward the confirmation of the generally accepted views.

As is well known, the commonly accepted view of botanists is that growth in the thallus in the Marchantiaceæ and allied forms takes place by means of several initial cells.[1] From careful serial microtome sections of young plants grown from gemmæ of *Marchantia polymorpha* it seems very probable that in these young plants there is only one apical cell. In a series of longitudinal vertical sections of a number of young plants only one apical cell was found (fig. 1). Sections made parallel to the surface (longitudinal transverse) of plants of the same size and age as those just mentioned show two or three cells lying side by side, which have been regarded as initial cells, and may yet be so regarded. Kny (Bau und Entwickelung von Marchantia polymorpha, p. 374) says: "At the bottom of the apical indentation, slightly bent toward the under side, there is a row of cells each of which is bounded externally by a free, slightly curved wall and has two side walls converging slightly toward the front and two posterior meeting the latter at right angles and cutting each other at the back (nach rückwärts). [That is, the apical cell is in the shape of a broad wedge]. Although one or two cells necessarily occupy a middle position within the row, we cannot therefore speak positively of two or more apical cells, because it is not possible to demonstrate that a certain one or two cells form the permanent organic middle point from which regular segments are derived. The possibility is not excluded that by further growth in width on one side of the apical region, one cell, at first exactly in the middle, or its axial descendants, may be pushed to one side." Now from sections parallel to the surface of a young plant of Marchantia polymorpha (fig. 2) it is difficult to say whether cells x, x', and x'', are all apical cells or just one, x. From the statement of Kny just quoted I am rather inclined to think that one cell, x, is the true apical cell, and x' and x'' are segments just cut off in the order indicated. From fig. 3, a similar section of the thallus of *Asterella hemisphærica*, it is seen that very much the same order exists, it being difficult, if not impossible, to decide whether one, x, is the apical cell and x' and

[1] Schenk: Handbuch, vol. 2, p. 331. 1882. Leitgeb: Untersuchungen ueber die Lebermoose, part 6, p. 2. 1879. Also: part 4, p. 16.

x'' only segments, or whether all are apical cells. Essentially the same thing occurs in *Conocephalus conicus*, *Anthoceros lævis*, and *Riccia*. Moreover as stated in a foregoing paragraph, only one apical cell has been found in longitudinal vertical sections, as shown in figures 1, 4, 5, and 6. Yet it may be, from the fact that this row of cells is arranged in a curved position on account of the hinder part being wider than the fore-edge, that longitudinal sections would pass only directly through the long axis of one cell, the others being cut more or less obliquely, thus obliterating the appearance of the segments of the apical cell. In older plants this might perhaps be more probable, but in young plants (and this was the kind used) the planes of the longitudinal axes do not seem to diverge enough to obscure the arrangement of the segments.

However this may be as to the number of apical cells, such are the facts observed by me, and from these it seems that it is as probable that there is but one as that there are several.

The resemblance between a fern prothallium and a young thallus of Marchantia polymorpha grown from a spore, is indeed very striking, as will be seen upon comparing fig. 7 with a young prothallium. In this (fig. 7) there is but one apical cell whose segments already cut off can be followed without the slightest difficulty. A transverse section through the growing region of a fern prothallium shows a structure similar to that in the liverworts under consideration (fig. 8). Here will be seen one or several initial cells, the number varying with the width of the sinus.

All sections were cut from specimens imbedded in paraffin, by a Minot microtome. The specimens were fixed in chromic acid 1 per cent. or absolute alcohol, stained *in toto* with alum cochineal, and counterstained on the slide with Bismarck brown (70 per cent. alcohol solution). The Bismarck brown is a very satisfactory stain for cell walls.

Indiana University, Bloomington, Ind., March 5, 1891.

EXPLANATION OF PLATE XIII. — Fig. 1, longitudinal vertical section of growing point of young thallus of Marchantia polymorpha. — Fig. 2, transverse longitudinal section of similar plant. — Fig. 3, transverse longitudinal section through growing point of Asterella hemisphærica. — Fig. 4, longitudinal vertical section of same plant as 3. — Fig. 5, same, of Conocephalus conicus. — Fig. 6, same, of Anthoceros lævis. — Fig. 7, young thallus of Marchantia polymorpha grown from spore (after Kny). — Fig. 8, transverse longitudinal section through the apical region of a prothallium of Onoclea struthiopteris; the shaded cell is the egg-cell of an archegonium.

All figures are magnified about 350 diam. except 6 which is about 175 diam. and 7 about 1200 diam.

Some new Solanaceæ from Guatemala.

JOHN M. COULTER.

Mr. John Donnell Smith submitted to me a bundle of Solanaceous plants from his recent Gautemalan collections. Among them I find the following species which seem worthy of characterization, although in the present confused state of our knowledge concerning this perplexing group absolute certainty seems unattainable. Without any desire of possibly multiplying synonymy these species are put on record as follows:

Solanum Donnell-Smithii n. sp.— Said to be a vine, more or less rough with stellate hairs: prickles stout and subulate or recurved, yellowish, especially stout on the stem, usually more slender on the midrib and principal veins, copious or scanty: leaves rather large and membranaceous, oblong or ovate, sinuate-toothed or lobed, or even entire, 7 to 15 cm. long, with equally 4 to 6-rayed hairs below, and central division much elongated in the otherwise shorter-rayed hairs above: the simple loose few-flowered racemes or cymes soon lateral: calyx deeply 5-cleft, with stout often bulbous-dilated prickles and mostly long-acuminate lobes: corolla 2.5 cm. or more in diameter, whitish or light blue(?), deeply parted into lance-linear lobes, which are thickly stellate-pubescent without: anthers linear-lanceolate: the smooth globose berries becoming 1.5 to 2 cm. or more in diameter, turning red(?).— Escuintla, Depart. Escuintla, alt. 1100 ft., March 1890 (*J. D. S.* 2268); Concepcion, Depart. Escuintla, alt. 1200 ft., April 1890 (*J. D. S.* 2261); San Juan Mixtan, Depart. Escuintla, alt. 500 ft., April 1890 (*J. D. S.* 2262).

Brachistus Escuintlensis n. sp.— Glabrous throughout or minutely puberulent: leaves large and thin, ovate (often broadly so), acute or acuminate, usually oblique at base and more or less tapering into a petiole, entire or with a slightly wavy margin, very unequal in size, the largest becoming 20 to 23 cm. long and 12 to 13 cm. broad: flowers on pedicels of various lengths in umbellate axillary clusters along the main stem or on leafy branches: the short and broadly campanulate calyx with an entire margin (rarely a few almost indistinguishable teeth): corolla about 12 mm. long with 5 erect lobes 4 or 5 mm. long: berry globose, 8 to 9 mm. in diameter.— Escuintla, Depart. Escuintla, alt. 1100 ft., March 1890 (*J. D. S.* 2267).

Bassovia Donnell-Smithii n. sp.—Said to be 24 dm. high, more or less softly pubescent or even hirsute, the upper parts of the stem and inflorescence glandular: leaves ample and thin, petioled, ovate to ovate-lanceolate, acuminate, from almost entire to sharply sinuate-toothed or lobed, 7.5 to 17.5 cm. long, minutely pubescent above, more conspicuously pubescent below, the midrib and principal veins usually prominently bordered by dense whitish pubescence: flowers on long pedicels in rather dense axillary umbellate clusters: the glandular calyx with small but evident teeth: corolla with ovate obtuse or acute glandular lobes 5 or 6 mm. long: anthers whitish-scarious along the lines of dehiscence: "fruit red".—Gautemala, Depart. Guatemala, alt. 5000 ft., February 1890 (*J. D. S.* 2270); Dueñas, Depart. Zacatepequez, alt. 5000 ft., April 1890 (*J. D. S.* 2258).

BASSOVIA MACROPHYLLA. — Pansamalá, Depart. Alta Verapaz, alt. 3800 ft., April 1889 (*Türckheim* 1438). This plant was at first considered to be a variety of the new *B. Mexicana* B. L. Robinson, of Pringle's distribution of 1890, and is so reported in Mr. Smith's "Enumeration", Part II. However, Mr. Robinson has since kindly looked into the matter, and the conclusion seems evident that it is the South American Witheringia macrophylla, a plant of puzzling synonymy. Bentham and Hooker refer it to *Bassovia*, and Miers to *Brachistus*. The disposition made of it by Bentham and Hooker seems to be the most natural one.

Crawfordsville, Ind.

New Grasses.

GEORGE VASEY.

The discovery of a second species of Orcuttia makes it necessary to somewhat modify the generic characters. They should now read as follows:

[Tribe FESTUCEÆ, sub-tribe *Seslericeæ*.] **Orcuttia.**—Panicle somewhat spicate, with short, simple, alternate, sessile spikelets, somewhat distant below, and crowded toward the summit: spikelets many flowered, compressed: empty and flowering glumes much alike, with many prominent straight nerves, strongly toothed or lobed at the apex: palet equaling

its glume, narrow, thin, green on the strongly angled keels: anthers 3, styles 2, filaments and styles projecting beyond the apex.

Orcuttia Greenei n. sp.—Apparently annual, culms cespitose, many from one root, erect, finely pubescent, 8 to 10 inches high, with 8 or 10 nodes: sheaths shorter than internodes, loose, the lower ones particularly so, pubescent and striate: leaves erect, rigid, narrow, 1 to 1½ inches long, pungently pointed, the upper sheathing the base of the panicle: panicle 2 to 3 inches long, somewhat flattened, of 10 to 15 contiguous spikelets: spikelets flattish, ¼ to ½ inch long, of 5 to 15 flowers; empty glumes two-thirds as long as the flowering ones, all sparsely pubescent, green, oblong, with strongly toothed apex; flowering glumes 2 to 2¼ lines long, with about 5 sharp teeth at apex, folded excentrically; palet as long as its glume, narrow, strongly 2-keeled and hispid on the keels.—Collected on moist plains of the upper Sacramento, near Chico, California, June, 1890, by *Prof. E. L. Greene.*

Eragrostis spicata n. sp.—Culms perennial from strong rhizomes, erect, rigid, 3 to 4 feet high: leaves distant, rigid, erect, 10 to 15 inches long, involute toward the apex, sheaths longer than the internodes, ligule inconspicuous: panicle spikelike, very narrow, cylindrical, densely flowered, 10 to 15 inches long, tapering at top, branches closely appressed: spikelets about 3-flowered, 1 line long; empty glumes half as long, the upper broader, both obtuse or truncate, short ciliate on the keel; flowering glumes 3-nerved, short-falcate.—Collected at San Jose del Cabo, Lower California, by *T. S. Brandegee*, 1890.

Muhlenbergia Alamosæ n. sp.—Perennial, tufted: culms numerous, compressed or angled, erect, 2 to 2½ feet high, wiry, rarely with 1 or 2 branches near the base, with about 6 nodes, the upper ones distant: lower cauline leaves erect, short, 2 to 3 inches long, the uppermost 8 to 10 inches long, equalling the panicle: panicle 4 to 5 inches long, 1 to 2 inches wide, open, the branches in threes or fives below, unequal, capillary, the lower third or half naked, the upper part 15 to 20-flowered, pedicels short, diverging: spikelets purple, over 1 line long; empty glumes ovate-acuminate or awl-pointed, half as long as the flowering glume, which is white barbed below on the margins and on the nerves of the palet; awns flex-

uose, 6 to 8 lines long.—Collected at Alamosa in Sonora by *Dr. Ed. Palmer*, 1890, no. 407.

Calamagrostis densus n. sp.—Culms in large patches, from strong rootstocks, 3 to 4 ft. high, robust, leafy, 5 to 6 nodes; the lower sheaths loose and longer than the internodes, the middle ones shorter than the internodes, the upper including the base of the panicle; leaves often a foot long, rigid, plane or becoming somewhat involute at the long slender points, somewhat scabrous, as are the sheaths; ligule 1 line long, lacerate: panicle strict, lance-oblong, 4 to 6 inches long, rachis slightly scabrous, branches somewhat verticilate, appressed, 1 inch long and densely flowered: spikelets crowded, 2 to 2½ lines long; outer glumes linear-lanceolate, nearly equal, acute, slightly scabrous, margins slightly scarious; third (or flowering) glume a little shorter, narrow, apex slightly toothed and mucronate, a few short hairs at the base; awn, twisted near the base, a little longer than its glume; palet a little shorter than the glume, thin; sterile tuft, slender, one-third to one-half as long as the glumes, with few hairs.—Collected near Julian, San Diego co., California, by *C. R. Orcutt*.

Calamagrostis kœlerioides n. sp.—Culms erect, 2 feet high, rather rigid, smooth: leaves 2 to 6 inches long, narrow, somewhat scabrous, ligule conspicuous, laciniate, blade rigid, pointed, the upper very short: panicle spike-like, narrow, 3 to 4 inches long, the branches in short, approximate (or at the base rather distant) clusters: spikelets about 2 lines long, linear-lanceolate, rather smaller, but otherwise much as in *Calamagrostis densus;* the panicle having much the appearance of *Kœleria cristata*.—Collected near Julian, San Diego co., California, by *C. R. Orcutt*.

Department of Agriculture, Washington, D. C.

BRIEFER ARTICLES.

Simple mechanism to show geotropism.—Take the works of an old clock run by a weight rather than a spring and support them horizontally, i. e. with the shafts vertical. The weight is to be carried over a pulley outside the works and the pendulum is to be removed so that the wheels may be made to revolve at a much more rapid rate than in the clock. One of the shafts, that bearing the scape wheel, is longer

than the rest, so that the scape wheel is outside the frame, i. e. above it in the position described, being supported by a bearing not in the frame itself, but in a separate piece bent and riveted to the frame. This piece must be cut away and a new bearing made for the shaft under the scape wheel instead of above, which any ingenious boy can easily do. This leaves the scape wheel free to carry the seed pans.

Solder the middle of a stout, horizontal brass wire six inches long to the face of the scape wheel, and to each end of this wire a deep tin pill-box, an inch and a half in diameter, one for a seed pan and the other to be filled with ballast for a counterpoise. The edge of the pill-box, not its face, should be towards the wheel, and the face of it should be inclined at an angle of about sixty degrees to the horizon so that the radicles of the germinating seeds in their downward growth may press against the advancing face of the box. Most of this face should be cut away and a piece of glass put inside to serve as a window. Against this put the seeds, already germinated so that their radicles begin to appear, placing the radicles so as to point downward; fill the box with moist saw-dust, and set it going in a warm place, using a heavy driving weight (I used about twelve pounds). This will make the brass arms carrying the pill-boxes revolve at a sufficient rate to create considerable centrifugal force in the boxes. The germinating radicles will feel the force of this enough to deflect them at a considerable angle from the perpendicular.

The apparatus will run several hours and if you do not want to sit up nights to wind it, all the better, as the direction of growth during the night will be so obviously different from that during the day when the apparatus is running as to make the experiment more conclusive. —Goodwin D. Swezey, *Crete, Nebraska.*

Notes from Columbus, Ohio.—Among my last summer's collections from this vicinity was a form of *Bidens connata* Muhl. which was typical in every respect except that it had upwardly barbed awns. Dr. Sereno Watson, to whom the specimen was submitted, pronounced it unchanged in other characters. In making a revision of Sullivant's catalogue of plants of this vicinity, I find mention of plants near *B. frondosa* L., "except smaller and smoother; heads fewer-flowered, with pappus upwardly scabrous."

The following species of western plants, with the exception of Dysodia (not heretofore known in this locality), were collected the last of October about the winter-quarters of Sells Brothers' Circus, at Sellsville, Ohio, near Columbus, the Croton alone being out of bloom: Erodium cicutarium, Aster paucifiorus, Amphiachyris dracunculoides, Dysodia chrysanthemoides, Gutierrezia Texana, Helenium nudi-

florum, H. tenuifolium, Parthenium Hysterophorus, Solanum rostratum, Monarda citriodora, and Croton capitatum. The plants were first noticed by W. J. Greene of the Ohio Experiment Station, and appeared to be growing well and spreading. The seed was evidently scattered from cars or wagons upon the return of the show at the close of the season.—AUG. D. SELBY, *Columbus, Ohio.*

Continuity of the protoplasm in the Chantransia form of Batrachospermum.—Strasburger (Botanisches Practicum, p. 403, 2nd German edition), mentions the fact of the continuity of the protoplasm between the cells of filaments of Batrachospermum. The writer's attention was attracted to this phenomenon while studying the Chantransia form of one of the species of Batrachospermum, probably Chantransia (Batrachospermum) macrospora, from Florida; and the protoplasmic connection was so evident that he thought the readers of the BOTANICAL GAZETTE might be interested in his observations.

The phenomenon was first noticed in a slide of the alga which had been mounted in glycerine jelly. In preparing the specimen for the jelly the glycerine had caused a slight shrinkage of the cell-contents, drawing it away from the cell-walls in all parts of the cells except at the ends, where fine threads of protoplasm which pierced the end walls were plainly seen to connect the shrunken masses of protoplasm in the different cells. The figure, showing this condition, was drawn from a filament on this slide with a Abbé camera, power 600 diameters, (reduced one-half).

A very sasisfactory way of demonstrating the presence of the connecting fibril is to stain the alga filaments with an alcoholic solution of eosin, wash in water, and then carefully shrink the contents of the cells with dilute glycerine. The water washes the eosin out of the cell-walls leaving the granular matter of the cells deeply stained and the connecting protoplasmic threads slightly colored. Borax carmine also gave satisfactory results. Iodine and methyl violet did not differentiate clearly enough, the cell-walls being so deeply stained as to obscure the protoplasmic connections. However, the green filaments, with the contents shrunken a little, exhibit the connecting fibril in an unmistakable way. The Chantransia form is better to demonstrate the continuity of the protoplasm than the sexual form, because the cells are as a whole much larger.—BRADLEY M. DAVIS, *Indiana University, Bloomington.*

A method of studying the growth of tubers.—After a careful examination of all the literature on tubers and tubercles at hand it appears

that the application of the Baranetzky auxanometer to a study of their growth is either unknown or rarely practiced. No record of such use can be found. The writer therefore ventures to note a method of setting up the apparatus, for this purpose, which is now being employed with good results in the botanical laboratories of the University of Minnesota.

Potatoes are selected that make the tubers habitually some distance from the base of the aerial stem. The soil is removed through a separable side of the culture-box and a tuber is exposed. This is blocked up rigidly from below, in such a manner that no downward movement of the tuber can take place. A jacket made of two small square pieces of cigar-box wood is now fitted on the upper and under sides of the tuber, the lower piece resting on the block below. The pieces are held around the tuber by means of very slender rubber-bands and by small cleats on their faces which grip the tuber gently. The upper of these squares of wood is furnished with a central screw to which the thread of the tracing wheel is attached. The whole is then covered with soil and the side of the box replaced. The smoked cylinder is now brought into position, the battery and clock connected and the tracing-needle adjusted. The clock should be set to release the armature every three hours. Now, when growth takes place in the tuber, since no movement downward can ensue, the thread is released and the tracing-needle makes a vertical stroke, indicating the growth. (See Vines: Physiology p. 399; Sachs: Physiol. Eng. trans. p. 557; Pfeffer: Pflanzenphysiologie II, p. 86; Detmer: Handbuch Pflanzenphys. p. 257; Goodale: Physiol. Bot. p. 383.)

Experiments made up to date indicate but do not demonstrate a daily periodicity in the growth of the potato tuber. If such is the case two explanations would at once suggest themselves. Since the apparent maximum of growth in this organ lies between 10 P. M. and 8 A. M. it might be compared with aerial shoots and the rhythm be considered a hereditary trait, as the embryonic positive-heliotropic curvature of ivy shoots. More reasonable, however, would be the other explanation, co-ordinating the daily rhythm of the tuber with the rhythmic production of starch in the assimilating surfaces.

A more extended series of experiments along this line is being conducted by Mr. C. P. Lommen and he will doubtless be able to speak more fully upon the matter later on. This note merely calls attention to the method of study.—Conway MacMillan, *University of Minnesota.*

A monstrous form of a common field daisy.—The plant which I am about to describe was received from Virginia where it was found

blooming in a fence corner in December last during a period of warm sunny days and occasional sharp, frosty nights.

The head is normal as to the involucre, the white rays and a zone of a certain width of disk flowers. Then however comes a zone of ray flowers again, standing more or less upright and looking outwards; and surmounting the rounded summit of the receptacle is a tuft of the brown bordered scales quite similar except as to size to those of the involucre. There is no extension of the normal axis and no tendency to a repetition of the flowering or vegetating shoot; hence it is not an example of the not uncommon *proliferation* unless we should call it a case of inverted proliferation which would not be accounting for its existence.

The explanation which I would offer is based upon a hint obtained from Sachs's Plant Physiology where he describes an abnormal sunflower in illustrating the principles of acropetal succession in growth. I should say that an injury, possibly cold, arrested growth at the developing apex of the receptacle when this latter was still quite young so that it ceased to be the growing point. Just below and round about this region renewed proliferation of embryonic tissue began and proceeded backwards towards the older parts, forming a new growing zone to which the arrested original growing point now stood in the same relation as the older parts in the ordinary receptacle stand to the normal growing apex or centrum. In further development the disposition of the members of the inflorescence would now be in the true but inverted progressive sequence from the older to the newer parts of the axis; that is, the abnormally placed involucral scales about the center, followed by the ring of ray flowers and these succeeded by the disk flowers which merge into those of the unaltered parts of the receptacle.—B. W. Barton, *Baltimore, Md.*

EDITORIAL.

It really seems that the flood gates have been opened in the matter of priority in nomenclature and that we are to be deluged with ancient names for well-known plants. That too great conservatism may have withheld the authors of our floras from making needful changes may be conceded to those who are radical reformers, since it is of no importance for our present purpose. But the search after new-old names is leading those who are making changes into some ludicrous and even ridiculous blunders. It is not our intention to

single out examples of these from the numerous ones in recent publications. Rather it is our endeavor to stay the tide of folly.

MANY BOTANISTS who appreciate their limitations in the matter of describing new species, ignore or underrate their limitations in the matter of nomenclature. It is vastly easier as a rule to determine and describe a new species than to settle on the oldest proper name of a plant. In the latter, experience is of even greater value than in the former. Those who think it a mere matter of searching through books will find in their undoing that it is much more.

IS IT NOT also curious, from a psychological point of view, that one who is compiling a local flora or writing an article on local plants, should decline to use the names applied to the plants in the flora of the country — names which it is quite certain designate unmistakably what plant is meant — and should go searching after other names which *may* be older and *may* be applicable to the plants under consideration? Is it not evident that something other than a clear indication of the plants is sought? Is it the cheap renown of differing from "an authority?"

WHILE LESQUEREUX and James's Manual is the best book on the mosses of North America, let us use the names therein, even though we see their faults. While Gray's Manual remains the best book on the flowering plants of its range let us use its names, and "therewith be content." And so of every book. Accept the best till there is a better. Only when monographing a group has one a moral right to discard any name however bad.

CURRENT LITERATURE.

Minor Notices.

PLANTÆ EUROPEÆ is the title of an important work by Dr. K. Richter, whose first volume has just appeared. It is intended to be a systematic enumeration, with synonymy, of the indigenous phanerogams of Europe. The first volume contains 378 pages, with a very complete index, and presents the Gymnosperms and Monocotyledons. In the matter of nomenclature the oldest specific name is adopted, in whatever genus it has appeared. The Gymnosperms show 8 genera and 40 species; while the Monocotyledons have an enumeration of 251 genera and 1799 species. The largest family is Gramineæ, with 751 species, followed by Liliaceæ (342 species), Cyperaceæ (287 species), Orchidaceæ (170 species), and Iridaceæ (105 species). The work is an

exceedingly important one, not only in bringing together in handy form all the species of phanerogams with their synonymy, but also in helping establish the nomenclature of European plants. It is published by Wilhelm Engelmann of Leipzig.

A HANDBOOK of Geographical Botany, by Dr. Oscar Drude, has recently been issued from the press of J. Engelhorn of Stuttgart, as one of a series of geographical handbooks under the general direction of Dr. F. Ratzel. The book contains nearly 600 pages and several colored maps, and is altogether one of the most complete compends of phytogeography that has appeared. The relation of plants to environment is discussed in all its ramifications. The conditions which cause a special display of certain plant groups in different regions are fully considered; and finally the different plant regions of the earth (some twenty-one principal ones) are described. We would commend this book to any would-be translator, as one that deserves to be speedily translated into English, for its range is world-wide and its usefulness should be equally extensive.

AN INTERESTING WORK, by A. Osw. Kihlman, entitled "Pflanzenbiologische Studien aus Russisch Lappland," has just been published in Helsingfors (Finland). It appears as a part of the Proceedings of the Finnish Biological Society. The book contains 300 pages, many additional tables, 14 plates, and a colored map. The plates, which are reproduced from photographs, are exceedingly interesting, showing the landscape of Lapland and the characteristic plant life. The flat land, the scraggy shrubs and trees, the deep snows, and the altogether dreary look make a strong impression. Of course, all this is but superficial; and the effect of these conditions on plant life is the theme which is fully discussed.

OPEN LETTERS.

To phytographers, especially Cryptogamists.

La longue expérience que j'ai faite dans l'élaboration de mon *Sylloge Fungorum omnium* m' a persuadé de l'utilité, je dirai même de la nécessité, de suivre dans la description des plantes certaines règles qui sont trop souvent négligées. Voici ces recommendations:

1. Il est nécessaire que les botanistes qui décrivent des espèces nouvelles en les traitant du point de vue de la morphologie et de la biologie, avec des détails très minutieux et très compliqués, y joignent des diagnoses spécifiques ou génériques (préférablement en latin) concises et comparatives selon les règles phytographiques. En effet il est très difficile et souvent très ambigu de choisir dans la foule des détails les caractères essentiels et différentiels.

2. La phrase spécifique ou diagnose est, pour certains auteurs particulièrement cryptogamistes, excessivement détaillée et prolixe et trop laconique pour d'autres. Une bonne phrase spécifique doit donner, en forme assez concise et claire, seulement les caractères essentiels et différentiels. Toute observation de détail doit être reléquée après la diagnose. Il est encore nécessaire pour les espèces nouvelles d'indiquer son affinité avec les autres connues plus prochaines. Celui qui détermine des espèces nouvelles sait combien de temps il doit perdre pour la détermination s' il a à faire avec des diagnoses très prolixes et sans notions d' affinité.

3. L'expèrience a déjà démontré, du moins dans la cryptogamie, qu'il est très utile, pour la désignation de la patérnité d'une espèce, d'indiquer entre parenthèses l'auteur qui a le premier décrit sous d'autres genres cette espèce. Il est toujours nécessaire d'ajouter le nom de l'auteur qui a transporté l'espèce du genre primitif à un autre, car sans cela on devrait entendre que l'auteur de l'ouvrage où la combinaison des noms est citée, est également l'auteur de cette combinaison. Nous trouvons par ex. dans les écrits de Winter des noms semblables: "*Sphærella convexula* (Schwein.) Syn. *Sphæria convexula* Schwein." Si nous n'ajoutons pas le nom Thümen après la parenthèse nous devrions croire que Winter est l'auteur de la combinaison; et alors nous aurons d'après les règles d'autres botanistes les deux notations suivantes: *Sphærella convexula* (Schwein.) Wint. ou *Sphærella convexula* Wint. qui sont toutes les deux fausses. Mais si nous disons *Sphærella convexula* (Schwein.) Thüm. nous avons la notion très exacte que Schweinitz a créé l'espèce et que Thümen l'a rapportée à son juste genre.

4. En décrivant les cryptogames parasites, il faut citer les plantes ou les animaux nourriciers avec la nomenclature technique latine. Les noms vulgaires (anglais, italiens, etc.) sont souvent difficiles à être identifiés.

5. Pour les mesures des organes tant microscopiques que macroscopiques, il est nécessaire d'adopter une mesure unique, savoir celle métrique; pour les mesures microscopiques, laissant de côté toute fraction, on devra préférer les micromillimètres ou microns (*micra*, μ). Les différentes mesures et les fractionnaires sont très souvent cause d' erreur ou de doute.

6. Pour désigner briévement les dimensions des organes microscopiques il convient (comme du reste plusieurs le font) d'indiquer d' abord le chiffre de la longueur et ensuite celui de la largeur plus grande avec le signe $\asymp$ entre l'une et l'autre en se passant du signe μ; si l' organe est comprimé on pourra ajouter encore le chiffre de l'épaisseur, par ex. : spore $15 \asymp 4$ signifie spore longue 15 μ et large et épaisse 4 μ; spore $15 \asymp 4 \asymp 2$ signifie spore longue 15 μ, large 4 μ et épaisse 2 μ. Plusieurs auteurs au lieu du signe $\asymp$ (que j 'ai proposé et suivi depuis 1872) emploient les signes =, : ,×, qui pour les mathématiciens ont une signification différente et définie. Pour les organes macroscopiques on devra indiquer la qualité de la mesure, savoir m., cm., mm. et la partie mesurée.

7. Dans la désignation de tous les groupes des plantes en général on emploie des noms féminins (*Dicotyledones*, *Ranunculaceæ*, *Anemoneæ*, etc.; on devra faire de même pour les Cryptogames; ainsi si nous

disons *Sphæriaceæ*, *Mucedineæ*, *Hydneæ*, etc., nous devrons necessairement dire aussi: *Pyrenomyceteæ*, *Hyphomyceteæ*, *Hymenomyceteæ* et non *Pyrenomycetes*, *Hyphomycetes*, *Hymenomycetes* comme voudraient beaucoup d' auteurs.

8. Les couleurs des plantes et particulièrement celles des corolles, des Champignons, des spores etc., sont souvent décrites avec des noms de signification incertaine. Il serait bien d' employer une nomenclature définie appuyée à des échantillons normales. Je vais publier à cet effet une *chromotaxie* qui sera, je l' espére, de grande utilité.

9. Pour ce qui concerne la nomenclature des fruits et des spores des Champignons, il serait utile d'employer seulement la suivante, qui au reste est adoptée par la plupart des mycologues:

Hymenomyceteæ: Pileus (quelle forme qu'il soit); basidia; sterigmata; sporæ; cystidia.

Gasteromyceteæ et *Myxomyceteae*: Peridium; gleba; capillitium; flocci; sporæ.

Uredineae: Sorus; uredosporae; teleutosporæ; mesosporae; pseudoperidium; æcidiosporæ; paraphyses.

Ustilagineae: Sorus; sporæ.

Phycomyceteae: Oogonia; oosporæ; antheridia; spermatia; zygosporæ; azygosporæ; zoosporangia; zoosporæ.

Pyrenomyceteae et *Phymatosphaeriaceae:* Stroma; perithecium; loculi; ascus; sporidia; paraphyses.

Discomyceteae et *Tuberoideae*: Ascoma; gleba; ascus; sporidia; paraphyses.

Schizomyceteae: Filamenta; bacili; cocci; endosporæ; arthrosporæ.

Sphaeropsidae: Perithecium; basidia; sporulæ.

Melanconieae: Acervulus; basidia; conidia (et non *gonidia*, nom qui doit être reservé aux Lichens).

Hyphomyceteae: Caespitulus; sporodochium; hyphae; sporae.

Obs.: Si la spore germe, il se forme le promycelium qui généralement produit les sporidiola.— P. A. Saccardo, *Padua, Italy.*

NOTES AND NEWS.

Prof. Maximowicz, of St. Petersburg, well known to all students of systematic botany, died February 16.

M. Marcel Brandza is publishing in *Revue générale de Botanique*, an exhaustive paper on the development of the seed coats.

In *Le Botaniste* (Feb. 25) M. P. A. Dangeard has a valuable illustrated paper on the morphology and anatomy of *Tmesipteris*.

The report of the mycologist, Dr. Roland Thaxter, to the Connecticut experiment station for the year 1890, is devoted to an extended account of the deep scab of potatoes and the organism that produces it, notes on several other plant diseases, and an excellent account fo certain fungicides and methods for their application.

UNDER THE EDITORSHIP of Prof. L. H. Bailey, the *American Garden* has become the sprightliest and most readable of the journals of its class.

THE FIRST BULLETIN of the Agricultural Experiment Station of North Dakota deals with grain smuts, a contribution by the Botanist, Mr. H. L. Bolley.

IN THE first of the Beihefte zum Botanisches Centralblatt F. Ludwig gives a résumé of the papers appearing during 1890 on the relation between plants and snails.

PROFESSOR JOHN M. COULTER has been elected President of the State University of Indiana, and will enter upon his duties at Bloomington next September.

IN *Journal of Botany* (March), Mr. T. D. A. Cockerell gives some account of the conspicuous European weeds that have become naturalized in the United States.

A POPULAR volume by M. C. Cooke, on the subject of edible fungi, will be issued shortly. It will be of a moderate size and price, and will contain colored plates of forty-four edible species.

M. A. LOTHELIER has shown by experiments that plants like Berberis or Hawthorn produce spines more freely in direct proportion to the degree in which they are exposed to the light.— *Gard. Chron.*

DR. EDWARD PALMER has recently returned from a three months collecting trip at Manzanilla and Colima, Mexico, having obtained about 500 species. These species will be reported upon by the botanists of the Department of Agriculture.

IN AN account in the *Botaniska Notiser* of European Uredineæ occurring at Quito, J. G. Lagerheim describes a new parasite of Puccinia graminis, which he calls *Fusarium Uredinis*. It attacks the uredosori, giving them a pinkish color.

IN *American Garden* (March), Mr. Walter Deane gives an interesting and illustrated account of the native orchids of New England. Every species seems to be mentioned and in a very readable way by one who knows them well in their native haunts.

FOUR SPECIES of North American plants have become established in the vicinity of Pavia, Italy, according to M. Bozzi (Atti. Soc. Ital. Sc. Nat., xxxi, p. 281). They are Oxybaphus nyctagineus, Commelina Virginica, Elodea Canadensis and Azolla Caroliniana.

THE SUMMER COURSE in botany at Harvard University will begin at the Botanic Gardens June 29, and continue five weeks. It will be under the instruction of Mr. W. F. Ganong, Instructor in Botany, and Mr. G. F. Pierce, Assistant in Botany, in Harvard University.

DR. DOUGLAS H. CAMPBELL has been appointed Associate Professor of Botany at the new Stanford University of California. As the Pacific slope is already well supplied with workers in systematic botany, that subject will not be represented at present in the new University.

A SORGHUM smut (*Ustilago Reiliana* Kühn) new to the United States is recorded by Messrs. Kellerman and Swingle (Trans. Kans. Acad. Sci., xii, 158), as occuring in Kansas. It attacks the panicle, and reduces it to a more or less uniform mass of spores. In Europe it also attacks the staminal inflorescence of Indian corn.

DR. W. J. BEAL has issued a bulletin (no. 72) describing the six worst weeds of Michigan. They prove to be Cnicus arvensis, Lithospermum arvense, Verbascum Blattaria, Linaria vulgaris, Plantago lanceolata, and Rumex crispus. A sample of the seeds of each is glued upon one of the pages, so that the farmer may intelligently examine his seed before sowing.

IN HIS "Notes on North American Trees," Professor C. S. Sargent has taken up the genus Acer (*Garden and Forest*, April 1). In regard to the confused synonymy of our sugar maple, the author inclines to the use of Michaux's name *A. barbatum*. Following most late authors, he merges Negundo into Acer and uses the Linnæan *Acer Negundo* as the name of our box elder.

WE NOTE with pleasure that Mr. Thomas Meehan, the editor of the *Gardeners' Monthly* until its discontinuance at the death of the publisher, and so long and widely known by his botanical writings, will soon begin the publication, assisted by his sons, of a new journal of gardening and botanical miscellany. It will be known as *Meehan's Monthly*, and the first number will appear July 1.

THE BOTANICAL CLUB of Washington has begun to make arrangements for entertaining the botanists of the A. A. A. S. They are intending among other things to issue a souvenir of about 40 pages, giving some account of the trees and shrubs of the streets and parks, with photographic illustrations. The large number of botanists in Washington will no doubt do all in their power to make a week's stay pleasant for visiting botanists.

MR. GEO. B. SUDWORTH shows in *Garden and Forest* (April 8) that if botanists adhere to the priority of specific name as rigidly as zoologists, that three of our well known plants should be called Negundo Negundo, Sassafras Sassafras, and Catalpa Catalpa. It occurs to us that his point is well taken. These extraordinary combinations seem not to have given zoologists any trouble, as a list of names from Jordan's "Manual of Vertebrates" testifies.

NEARLY ONE-TENTH of the British *Agaricini*, the group of mushrooms and toadstools, are good eating, as we learn from *Grevillea* (xix, 83). There are 1,400 species in the British Isles, of which somewhat over half are too small, rare or tough to be of culinary value. This leaves 680 species that may be edible. Of this number 134 are known to be suitable for the table, some 30 are poisonous, and of the remaining 516, nothing certain is known.

THE POPULAR notion that the sunflowers turn with the sun has been put to the test by W. A. Kellerman, who records (Trans. Kans. Acad. Sci., xii, 140), a large number of observations on the wild Helianthus annuus. He finds that about 87 per cent. of the heads while in bloom

show movement during the day, and a less percentage at night, but they usually turn through only a few degrees of arc. During the day 23 per cent. move somewhat toward the west, and 8 per cent. in the opposite direction. At night 21 per cent. move eastward, and 8 per cent. westward.

ANOTHER considerable contribution has been given by Mr. F. Boergesen in his "Desmidieæ" [1] to the knowledge of this group of Algae from Brazil. The material had been collected by Glaziou in St. Paul, and the number of about 130 species and varieties includes about 50 new ones, illustrated in four plates, finely prepared by the author himself. Of species and varieties enumerated, the largest numbers belong to the genera Cosmarium (29), Staurastrum (24), Closterium and Euastrum (16), Micrasterias (10), etc. The diagnoses are all given in Latin.—T. H.

WE are glad to welcome the first annual Bulletin of the Swiss Botanical Society. It is a volume of nearly 170 pages, with 3 plates, and contains original papers by Dr. H. Christ, Prof. Dr. Cramer, Dr. J. Früh, and Dr. H. Schinz. In addition to this there is an account of communications made to the society, among which we note a revision of *Krameriaceæ* in which *K. lanceolata* Torr. is made var. *angustifolia* of *K. secundiflora* DC. A good feature is an excellent and full résumé of the botanical work done during 1890 which had any reference to the Swiss flora.

THE PRODUCTION of tubercles on the roots of English beans has been accomplished by M. W. Beyerinck (Bot. Zeit., xlviii, 837) by growing the beans in a sterilized soil and applying pure liquid cultures of bacteria. The apparatus employed is of new and ingenious design. The experiments so far completed show that the tubercles on the various leguminous plants are not due to a single species of bacteria, but to several, which are also distinct from the soil bacteria producing nitrification. They also establish the fact that the bacterial growths do not originate within the plants, for the roots remained free of tubercles so long as the cultures of the specific bacteria were not introduced.

AN EARLY collapse of the plan of publishing general Fungi Exsiccati is predicted by M. C. Cooke in the last number of *Grevillea*, on the ground that there are too many being issued with too much duplication, both in the same and in different series. He notes that Puccinia graminis appears under six numbers in one series, and also under six numbers in another series, and both sets by the same collector. Pleospora herbarum appears under eleven numbers in one series, and under eighteen in another. A long list of American species is given, each species of which has been issued in from one to three American series and in as many foreign ones also. He advocates the publication of series restricted to certain groups. These views must meet the approval of the majority of mycologists.

[1] Eug. Warming. Symbolae ad floram Brasiliae Centr. cognosc. Particula XXXIV. Saertryk af Vidensk. Meddel. fra Naturhist. Forening, 1890. Copenhagen.

PUBLICATIONS
OF THE
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II. THE MEMOIRS.

No. 1 of Volume II of this serial, containing Professor Byron D. Halsted's illustrated payer on "Reserve Food Materials in Buds and Surrounding Parts" has recently been issued. Price, 50 cents. Volume I, complete, containing papers by Professor L. H. Bailey, on "Studies of the Types of Various Species of the Genus *Carex*"; by Mr. Isaac C. Martindale, on "A List of the Marine Algæ hitherto observed on the Coasts of New Jersey and Staten Island;" by Dr. Richard Sprnce, on "An Enumeration of the Hepaticæ collected by Dr. H. H. Rusby in South America," containing descriptions of many new species; and by Dr. E. Lewis Sturtevant, on "Seedless Fruits," may be had for the subscription price, $3.00. The price of Volume II complete will be the same.

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